Proposed Revisions to 314 CMR 4.00: Massachusetts Surface Water Quality Standards Regulation

Aluminum Freshwater Criteria Update

MassDEP Proposes to Adopt EPA's 2018 Recommended Aluminum Freshwater Criteria Protective of Aquatic Life

Background and Reason for Change

The purpose of the 314 CMR 4.00: *Massachusetts Surface Water Quality Standards* (SWQS) regulation is to restore, enhance, and protect the chemical, physical, and biological integrity of surface waters in Massachusetts. The SWQS were adopted to designate the most sensitive uses for which surface waters are to be regulated, prescribe the minimum water quality criteria required to sustain those uses, restore waters to those uses, and maintain high quality waters.

The Federal Water Pollution Control Act, 33 USC §1251, et seq. (known as the Clean Water Act or CWA) and associated federal Water Quality Standards, 40 CFR Part 131, require the U.S. Environmental Protection Agency (EPA) to periodically publish updated or new recommended ambient water quality criteria (AWQC). The CWA and these federal regulations also require states to periodically review and, as appropriate, to update the AWQC they have adopted in State regulations. Each State has the option of either adopting the federally recommended criteria or developing its own criteria, subject to EPA review and approval. EPA may also promulgate criteria for a State that develops criteria that are not protective or that neither adopts EPA's recommended criteria nor develops its own.

Aluminum is the most abundant metal in the earth's crust. Multiple pathways exist for aluminum to enter surface waters, including wastewater effluent discharges. Elevated levels of aluminum can affect the regulation of ions and inhibit respiratory functions in aquatic species, potentially leading to death. Aquatic life pollutant criteria are derived to protect aquatic organisms from lethal effects (acute criteria) as well as effects on growth and reproduction (chronic criteria). Currently, the SWQS aquatic life aluminum criteria reflect EPA's 1988 guidance featuring fixed acute (750 µg/L) and chronic (87 µg/L) values.

EPA Guidance

In a 2018 guidance document, EPA updated its recommended fresh water aluminum criteria for aquatic life. This guidance uses multiple linear regression (MLR) models that incorporate local pH, hardness, and dissolved organic carbon (DOC) data to derive aluminum criteria ("MLR criteria"). These MLR criteria better reflect the impact of local water chemistry on the bioavailability and toxicity of aluminum. EPA also released an Aluminum Criteria Calculator, v.2.0 ("the Calculator"), with the new guidance. The Calculator will be available on MassDEP's website and can be used to derive MLR criteria using local water chemistry input data.

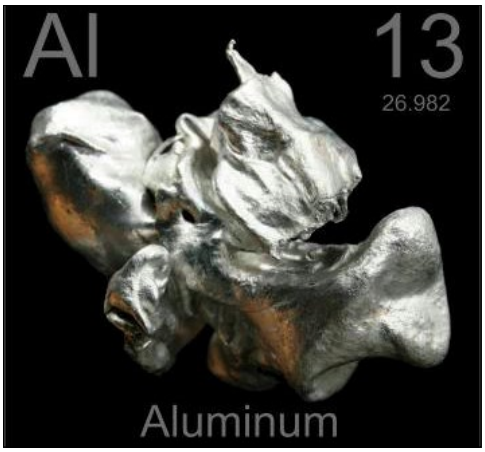

Photo: https://periodictable.com

Spotlight

EPA's guidance uses multiple linear regression (MLR) models that incorporate local pH, hardness, and dissolved organic carbon (DOC) data to derive aluminum criteria. These MLR criteria better reflect the impact of local water chemistry on the bioavailability and toxicity of aluminum.

Eastern brook trout (EBT)
Salvelinus fontinalis

Questions or comments? Email the Director of MassDEP's Watershed Planning Program at laura.blake@mass.gov.

Proposed Aluminum Freshwater Criteria Update (cont.)

Proposed Revisions

MassDEP is proposing to adopt the MLR criteria into the SWQS regulation by creating Table 29, Generally Applicable Criteria. Table 29a, the Aquatic Life Criteria table, incorporates the proposed MLR criteria and default MLR criteria that MassDEP calculated for watersheds or watershed groups using Massachusetts water quality data. The default MLR criteria are provided as an appendix to Table 29a (see Table 1 below) to be used when local data are not available. These default MLR criteria were derived by first calculating multiple MLR criteria for each watershed or watershed group and then calculating 10th percentile values (protective 90% of the time). To protect endangered species, 5th percentile values were calculated (protective 95% of the time) for certain watersheds. If the proposed revisions are approved by EPA, and data are available to calculate MLR criteria for a given location, the MLR criteria would supersede defaults. The proposed aluminum criteria are expressed as total recoverable concentrations and vary by location, while remaining protective of aquatic life.

Table 1. Default Freshwater Aluminum Criteria by River Basin or Coastal Drainage Area*

River Basin or Coastal Drainage Area	CMC† (Acute) µg/L	CCC† (Chronic) µg/L
Blackstone	542	270
Boston Harbor/Charles	970	390
Buzzards Bay/Mt. Hope Bay/Narragansett Bay/Taunton/Ten-Mile	490	260
Cape Cod Coastal	**	**
Chicopee (5th percentile)	291	171
Connecticut (5th percentile)	630	300
Deerfield	450	220
Farmington/Westfield (5th percentile)	309	180
French/Quinebaug	580	280
Housatonic/Hudson	1400	520
Ipswich/North Coastal/Parker	954	406
Islands Coastal	**	**
Merrimack/Shawsheen (5th percentile)	470	259
Millers	340	210
Nashua (5th percentile)	350	200
South Coastal	1200	460
Sudbury, Assabet, and Concord (SuAsCo)	954	394

*Defaults are based on 10th percentile criteria calculated from concurrent pH, DOC, and hardness data, except watersheds marked as 5th percentile to protect state and federal endangered species.

** Insufficient data are available to calculate watershed-based default criteria.

†The CMC = Criterion Maximum Concentration and the CCC = Criterion Continuous Concentration

Regulatory Implications

The proposed default criteria are generally higher (less stringent) than the existing criterion; however, the default acute criteria are lower (more stringent) in some cases. For facilities permitted under the National Pollutant Discharge Elimination System and MassDEP's Surface Water Discharge Program, these proposed water quality criteria cannot be used for establishing effluent limits until they have been promulgated into the SWQS and approved by EPA. Facilities planning to collect data to derive MLR criteria would need to consult MassDEP early in the process to develop a Quality Assurance Project Plan. MassDEP plans to release a guidance document for facilities on data requirements and implementation procedures for aluminum criteria when the proposed SWQS revisions are finalized. Please also refer to the Antidegradation and Anti-Backsliding Implementation fact sheet for more permit implications.

For more information on EPA's aluminum criteria and the aluminum calculator see https://www.epa.gov/wqc/aquatic-life-criteria-aluminum

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